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DESIGNING INTERACTIVE MICRO-CONTENT FOR MOOCS. DESIGN APPROACH AND IMPLEMENTATION IN THE OBERRED PROJECT

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Abstract

Massive Open Online Courses (MOOCs) have opened and enhanced access to online education for the worldwide audience. Given the need to move MOOC content away from the traditional educational media to interactive modular content, this paper presents an approach to designing interactive micro-content for MOOCs, applied in the MOOC “Open Badges for Open Research” developed in the Erasmus+ strategic partnership on Open Badge Ecosystem for Research Data Management (OBERRED). The key goal of the MOOC is to help learners develop a capacity to use Open Badges in the field of Research Data Management (RDM). The design of the micro-content for the MOOC draws on available resources including existing OERs and applied the H5P technology (a free and open-source toolkit for creating learning resources in form of HTML5 packages) to create interactive micro-learning objects. This paper outlines the design methodology and showcases selected examples of interactive micro-content created with H5P and integrated in the MOOC to make the learning experience motivating and engaging. The paper also describes the technical implementation of H5P micro-content in the European MOOC platform EMMA and presents the results from qualitative evaluation, which applied the cognitive walkthrough methodology to elicit user requirements. All micro-learning objects created with H5P are available as OERs under Creative Commons Licences. The paper ends with conclusions about designing interactive micro-content for MOOC and formulates recommendations for further design and research on micro-content design in MOOCs.

Keywords: MOOCs, micro-learning, micro-content, interactive content, H5P.

1 INTRODUCTION

Massive Open Online Courses (MOOCs) have opened and enhanced access to online education for all. According to 2020 statistics[1], there were 180 million students participating in 16.3k courses from 950 universities last year (excluding China). The ongoing pandemic has also contributed to the growth of users worldwide, who have used MOOCs as opportunities for education, career and self-development, which has been been in line with previous research showing that taking MOOCs often coincides with planning a career change, and/or new education and life track [1]. During the pandemic, MOOC providers could reach out to even wider audiences with broader interests [2]. The top three most popular MOOCs in 2020 were “The Science of Being Well” on Coursera, “Introduction to Computer Science” on edX, and “Machine Learning” on Coursera[2]. The significant role of MOOCs in higher education during the pandemic has been revealed in current research studies [3], [4], [5].

In general, the main benefits of MOOCs have included the wide offer of courses on different topics and in different languages for the global audience, open access and flexible modes of participation, interactivity and social networking opportunities, the availability of free and relevant content including multimedia learning materials [6], [7|. Also, the design of content and the re-use of learning materials in MOOCs have played an important role in MOOC research and practice. One of the key issues has been the creation and the use of open educational resources (OER). OERs have been defined as learning, teaching, and research materials in any format and medium, available in the public domain or under an open license, which permits open and cost-free access, reuse, adaptation and redistribution [8]. The use of OERs in MOOCs has gained further relevance during the pandemic. In their guidance on utilizing OER under COVID-19 pandemic, in line with UNESCO OER recommendation, [9] emphasised the importance of using OERs in MOOCs in combination with pedagogical methodologies to provide a broader range of educational options to learners worldwide.

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[1] https://www.classcentral.com/report/mooc-stats-2020/

[2] https://www.classcentral.com/report/tag/coronavirus/

The potential of OERs to support inclusive education for learners with diverse needs and preferences, has been considered as one of the key strategies for granting learning equal opportunities [9]. Some of the key criteria for the selection of OERs include licencing, accuracy and quality of content, cultural relevance and sensitivity, ease of adaptability, design quality and interactivity [9]. While design quality focuses on providing positive learning experiences (e. g. through the use of colors, fonts, text size, spacing, navigation menus), interactivity focuses on increasing the learning engagement and motivation of learners (e. g. through the use of interactive open textbooks, instead of non-interactive PDF files, to activate learners and increase interest to learn) [9].

A number of authors and practitioners have emphasised the need to move MOOC content away from the traditional educational media, such as providing a series of (long) video lectures, to more interactive and modular formats [10], [11], [12]. The modular and interactive content in MOOCs, also referred to as micro-content, has been considered an important element in the design of MOOCs and related to positive learning experience, active participation and higher completion rates [11], [13], [12].

In this paper we describe the design approach and the implementation of interactive micro-content for MOOCs in the Erasmus+ strategic partnership on Open Badge Ecosystem for the Recognition of Skills in Research Data Management & Sharing, OBERRED. The reminder of this paper is structured as follows: In section 2 we provide an overview of principles and methods used to design interactive micro-content for MOOCs in the OBERRED project. Section 3 describes the technical implementation in the European MOOC platform EMMA. Section 4 presents the results, which include the qualitative evaluation results and the integration of interactive micro-content in the MOOC “Open Badges for Open Science”. Finally, section 5 summarises the key conclusions for the design, development and implementation of interactive micro-content in MOOCs.

2 DESIGN PRINCIPLES AND METHODS

The OBERRED project[3] founded under the Erasmus+ program on cooperation for innovation and the exchange of good practices in higher education, has been dedicated to designing an Open Badge ecosystem for the recognition of skills in the field of research data management. The key part of this endeavour is to design and deliver a series of online training programs in the form of Massive Open Online Courses (MOOCs). The first MOOC in this series focuses on understanding Open Badges in the context of Open Science. The objective of this introductory MOOC is to prepare the participants for the use of Open Badges in their work with relevant stakeholders in the field of research data management (RDM), for example to design Open Badges in order to recognize skills related to RDM. Building on the first MOOC “Open Badges for Open Science”, the two further MOOCs, i. e. “Managing and Sharing Research Data” and “Facilitating the Open Badge Ecosystem”, prepare the participants for the implementation of the recognition of skills in further fields of research data management.

The overall approach to designing MOOCs in the OBERRED project is based on the ADDIE model, which is a generic instructional model and a systematic approach to design and development of training [14]. The ADDIE model structures the design process into five phases: Analysis, Design, Development, Implementation, Evaluation. Each step in the ADDIE model provides an outcome that feeds into the subsequent step. The ADDIE approach has been evolving together with the advancements in understanding how humans learn and how technologies can be used to support learning [14]. The process of revising and updating the ADDIE model has been informed by insights from different fields including psychology and instructional design [14].

In the next section we describe the methodology of instructional design based on the ADDIE model applied to designing the first MOOC “Open Badges for Open Research” and its interactive micro-content using the H5P framework.

2.1 MOOC Design

The design of the MOOC “Open Badges for Open Research” has been created in a number of iterative stages following the ADDIE model. The design approach has been documented in a living document created in Google Docs, which has been updated throughout the design iterations.

In the first stage of the ADDIE process, the project team conducted an extensive analysis of relevant issues. The analysis part describes the context of the MOOC and the conceptual links to the two other MOOCs in the OBERRED project. The analysis lists the requirements for the design of the MOOC, and defines target groups and their characteristics in relation to the specific roles in Research Data Management (RDM). The analysis part also defines the learning outcomes, following the competency-based approach to designing MOOCs and the definition by [15], who defined the competence as the "capacity to select, combine and adequately use the knowledge, skills and other acquisitions like values and attitudes in order to successfully solve a certain category of work or learning situations and for professional or personal development" [15, p. 973]. The MOOC is structured into three levels, with each part having a specific set of learning outcomes. The three levels are: (A) Foundations Level, (B) Technology Level, and (C) Application Level. Each level has three distinct learning outcomes (LOs, cf. section 4.2 below). Furthermore, the analysis part outlines the delivery model of the MOOC and addresses such issues as language policy, copyright policies, assessment and micro-credentialing policies as well as the timeline for the project completion. In this way, the analysis part provides a comprehensive description of meta-level design decisions and serves as a guideline for further phases in the ADDIE design process.

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[3] http://oberred.eu/

The design part deals in more detail with learning outcomes, assessment and micro-credentialing methods as well as MOOC content, learning activities and media. The design section specifies the instructional design principles of micro-learning and micro-content drawing on the guidelines on designing micro-learning as a strategy for ongoing professional development by [16]. This part also specifies the MOOC design principles recommended by the European MOOCs platform EMMA and the principles proposed by [17] and [18]. The key design principles for the MOOC design include: (a) a *competence-based design* approach, which focuses on learning outcomes; (b) *learner empowerment*, which provides strategies that change the perception of learners as active participants in contributing to the creation of the Open Badge Ecosystem in the RDM field; (c) *learning plan,* which provides a study plan and schedule with assignments, milestones and deadlines for clear orientation; (d) *collaborative learning*, which focuses on designing activities and tasks in which collaboration is an added value; (e) *social networking*, which incorporates the social aspects as a source of peer-to-peer networking; (f) *peer-feedback* which focuses on adding value through commenting and social appraisal; (g) *quality criteria for knowledge creation and generation*, which are related to the notion of learner generated content, and (h) *media-technology-enhanced learning*, which focuses on offering learners a variety of media (text, audio, video, pictures) to enhance attention and retention. Furthermore, following the constructive alignment approach proposed by [19], the design part also specifies how learning outcomes are to be aligned with learning activities and assessment. The SOLO Taxonomy by [20] is used to map verbs in learning outcomes statements to the levels of learning and to assessment criteria. The design part also outlines the MOOC structure, which results from the break-down into the three levels and the micro-learning units. In order to specify content for each micro-learning unit, the *storyboarding technique* was applied. A storyboard was created for each learning outcome and specifies learning content, format, media/materials, and instructional methods. The design part finishes with the specification of the digital credentials (Open Badges) issued upon successful completion of each level, as well as specification of open licenses for the MOOC.

The development part of the concept describes the process for creating the MOOC in the EMMA platform and the steps and methods for the production of course materials. The production of course materials includes the reuse of selected OERs using such tools as H5P and the different content type formats provided by H5P[4]. The development part of the concept also specifies how reviews are to be carried out following the interactive approach to MOOC design. After production of each version of the MOOC, reviews are conducted, and results are as feedback for the next iteration.

The implementation phase describes the procedure for delivering the MOOC with focus on the preparation of facilitators and learners. Since the MOOC is designed for self-directed learning with the support of the facilitator, the key tasks of the facilitator including the preparation and the support of MOOC participants are described in the implementation part in detail. The delivery of the MOOC in the implementation phase is based on the model of online moderation by Gill Salmon [21].

The specification of the MOOC design based on the ADDIE model ends with the evaluation phase and consists of two parts: formative and summative evaluation. The formative evaluation is present in each stage of the ADDIE process and includes peer reviews, user tests and cognitive walkthroughs. The summative evaluation specifies the post-MOOC survey including survey items, scales and survey tools, and the learning analytics approach using log data from the EMMA platform.

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[4] https://h5p.org/content-types-and-applications

2.2 Interactive micro-content

The design and production of the interactive micro-content for the MOOC is specified in the design and the development parts of the MOOC concept following the ADDIE model. The design part specifies the micro-content approach to designing MOOC content. Micro-content means content in short, simple and targeted form [16]. The scope and length of the micro-content are determined by the learning outcomes for the specific level of the MOOC. The design principles specify that all micro-content units in the MOOC are to be self-contained so that they can be understood without any additional information. Micro-content in the MOOC is designed to convey one primary idea or concept related to the specific learning outcomes and should be accessible as a single content package appropriately formatted for presentation in desktop and mobile devices.

The five essential micro-content design principles applied to the design of interactive content for the MOOC are based on the recommendations by [16] and include (1) *Format*: micro-content is designed in small, compact format enabling immediate perception; (2) *Focus*: micro-content has a clear focus and express a particular topic entity; (3) *Autonomy*: micro-content units are self-contained; (4) *Structure*: micro-content is structured to comprise such elements as title, topic, author, date, tag; (5). *Addressability*: micro-content is designed as a single resource with a possibility of direct reference.

Based on the principles listed above, the micro-content design principles applied in the MOOC encompass: (a) Designing micro-content as small chunks of information, focusing on a single definable idea or topic; (b) Using available OERs in forms of micro-content, e. g. short videos (max. 5-10 minutes) instead of long lecture recordings, short texts instead of lengthy documents; (c) Creating new learning materials in form of micro-content, reusing and remixing OERs.

The H5P framework was used to create the interactive micro-content for the MOOC. H5P is a free and open-source content collaboration framework based on JavaScript and offers a wide range of content formats. H5P enables to produce interactive content in form of HTML5 packages which can be reused (i. e. downloaded as .h5p files and then uploaded to any website where H5P content may be created), and/or embedded (as iframe script). H5P is used to create OERs, which can be shared on the H5P OER Hub[5]. H5P is an easy to use authoring tool and does not require advanced design skills or extensive technical experience. Compared to more traditional authoring tools for e-learning content, H5P supports the creation of playful and interactive micro-content [22]. Table 1 lists examples of the micro-content developed with H5P for different Learning Outcomes in the first OBERRED MOOC.

Table 1. Examples of H5P Content used in the MOOC.

Learning Outcome	***Title***	***H5P Content Type***
LO 1.1.: Report on how you understand the concept of Open Badges.	What is a badge?	Interactive video[6]
	Open Badge Ecosystem	Drag & Drop[7]
LO 1.2.: Present the context of the Open Badges including history and organisations.	History of Open Badges	Timeline[8]
	Benefits of Open Badges	Ques the answer[9]
LO 3.2: Plan your own Open Badges project	Badge Design Canvas	Image Hotspots[10]
	Design Principles Cards	Image Slider[11]

The following section describes the technical implementation of interactive MOOC content created with H5P and delivered in the European MOOC aggregator platform EMMA.

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[5] https://h5p.org/oer-hub-coming

[6] https://h5p.org/interactive-video

[7] https://h5p.org/drag-and-drop

[8] https://h5p.org/timeline

[9] https://h5p.org/guess-the-answer

[10] https://h5p.org/image-hotspots

[11] https://h5p.org/image-slider

3 TECHNICAL IMPLEMENTATION

3.1 Platform Architecture

Funded by an EU CIP Program, the European Multiple MOOC Aggregator (EMMA) provides a transnational MOOC platform in Europe, allowing for the integration of MOOCs with different instructional design and pedagogical approaches, such as cMooc, xMooc, hMooc, to promote cross-cultural learning. The guiding principles behind EMMA include research-based design; participatory policy design; agile development; invisible and flexible technology. EMMA provides tools to support learners in creating their own study paths and coursebook, harvesting material from multiple MOOCs and sources. A range of data collection tools are available to evaluate user response to the EMMA concept and applied instructional approaches. Furthermore, EMMA has several affordances designed to enhance real-time individual and collective learning, and to encourage participation and collaboration. An integrated system of monitoring tools allows to analyse learning patterns by combining retrospective learning analytics, e. g. enrolment, engagement, persistence, dropout and completion, and user opinions with the aim of improving MOOC design and teaching practice. A range of tracking features with accompanying dashboards provides feedback on learning activities and outcomes to raise student awareness, engagement and progress.

3.2 Integration of H5P content in EMMA

Research on the use of H5P in education is still in its infancy. A quick search using Scopus highlights a rise of scholarly works only from 2015 when H5P toolkit was introduced in academic activities to manage the cognitive load and maximise engagement [23]. In 2017, at the Victoria University in Australia, over 6.000 H5P Learning Objects were created, 2.000 of them were shared to be reused in teaching [23]. The most relevant objective in using H5P is to ‘activate’ learner memory, reflection, reasoning capacity by challenging learner experience and stimulate their curiosity.

Learner interactions are not defined only by platform affordances, but through course design. As mentioned above, EMMA provides several possibilities for enhancing learners’ interactions with different pedagogical approaches and technical solutions. These include forums attached to each page of the course, structured like a Facebook page; individual student blogs that can be used for knowledge creation and sharing and where digital artifacts can be shared as an assignment or project; seamless access to different social media channels for knowledge construction activities; peer assessment/review for encouraging learners to give constructive feedback to each other.

One of the latest features implemented in EMMA to meet the expectations of the OBERRED MOOC “Open Badges for Open Science” is the H5P technology. H5P is a toolkit that makes it possible to create, share and reuse HTML5 content and applications with little or no LMS adaptation. H5P.org is an open source community-based project born to cope with one of the main technical barriers in OER reuse: the translation of existing material in tailored educational practices by adaptation, integration, contextualization, content inquiry strategies. This also implies a positive impact on cost and time reduction, enhancement of creativity, and teacher autonomy. For years, edutech experts and educational institutions have spent much effort in fostering innovation of pedagogies and teaching methods by introducing the use of digital technologies in schools and by empowering teachers with knowledge in coding and computer use. The use of H5P enables existing competences to advance in creating richer educational experiences while supporting literacy in multimedia development.

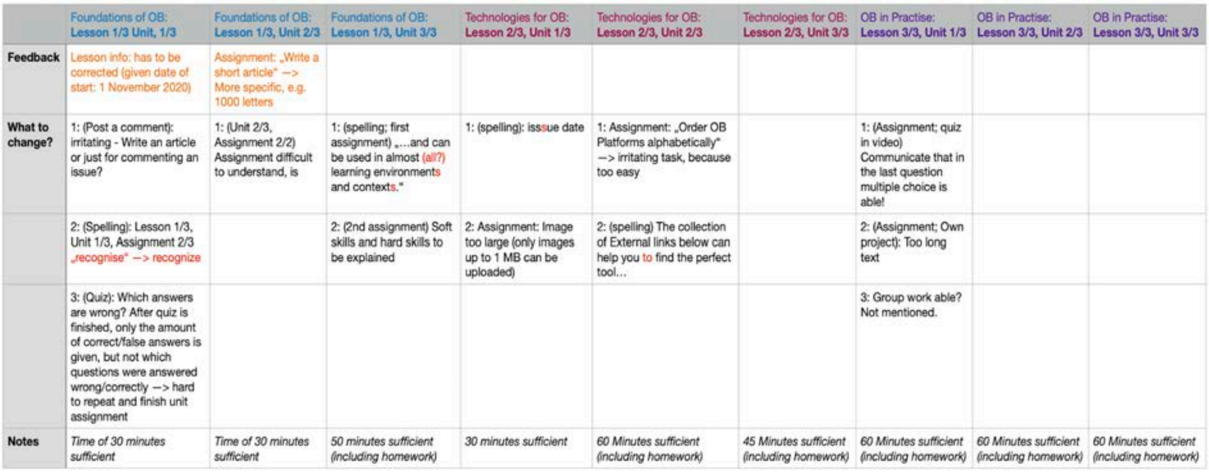
The H5P technology can be used both on H5P.org, by paying a monthly fee, or on own CMS/LMS platforms by installing an open source plug-in. In the case of EMMA, which is a platform designed from scratch, a feasibility analysis was necessary to verify the compliance with the available plug-ins (Wordpress, Drupal etc). Once it was verified that the installation or to adaptation of an existing plug-in in EMMA would not be feasible, the EMMA technical team has decided to install a WordPress platform on a own server registering a new domain (EmmaInteractive.eu). The H5P plug-in for Wordpress was installed to support all H5P content types. In this way it was possible to make a seamless transition of content between the EMMA MOOC platform and EmmaInteractive in Wordpress. Embedding an H5P object in the EMMA MOOC platform proved to be quite simple, as it uses the same modality used by the h5p.org platform. First, the iframe tags, which come with the object, have to be identified and then added to the CMS/LMS by copy & paste. Usually, the text editor facilitates this task by offering a ready-made option button to embed external video. The iFrame (inline frame) tag is used to embed H5P content in the MOOC in EMMA. In the past, iframe was used to integrate a website inside the “frame” of another website. In the meantime, the iFrame tag has become a useful resource to embed external objects, such as H5P Learning Objects, in web pages using the HTML code and allowing for more efficient use of web resources. Although the use of iFrame does not completely overcome IPR issues, it helps to break the technological barriers allowing non-experts to manage their webpages.

4 RESULTS

This section describes the results of the design process, i. e. the results from the qualitative evaluation of the initial versions of the MOOC with integrated H5P micro-content and the improved interactive micro-content applied in the final version of the MOOC “Open Badges for Open Science”.

4.1 Evaluation results

The qualitative evaluation was conducted to assess the quality of the initial versions of the MOOC with integrated H5P content. A cognitive walkthrough methodology including a qualitative survey was applied to support usability evaluation. The cognitive walkthrough is a technique for evaluating user interactions with the system and focuses on evaluating how well the user can use the system for the first-time without any formal introduction or training [24]. The cognitive walkthrough allows taking on a user’s perspective and identifying problems that might arise in user interactions with the system [24]. Two small-scale cognitive walkthroughs were conducted with two prototypical users at different points in time during two different iterations in the MOOC design. The first wall-though took place in September 2020 with a computer science student involved in Open Research. The second walk-through took place in December 2020 with an HR consultant. In both cases, the study participants worked through all levels and units in the MOOC and were supervised by the MOOC designers. The aim of the cognitive walkthroughs was to elicit user requirements as guidelines to improve the design of the MOOC including the overall usability and the MOOC content created with H5P. The supervising designers documented suggestions during the process of the evaluation in the changelog tables. Figure 1 shows part of the changelog from the second cognitive walkthrough.



	Foundations of OB: **Lesson 1/3 Unit, 1/3**	Foundations of OB: **Lesson 1/3, Unit 2/3**	Foundations of OB: **Lesson 1/3, Unit 3/3**	Technologies for OB: **Lesson 2/3, Unit 1/3**	Technologies for OB: **Lesson 2/3, Unit 2/3**	Technologies for OB: **Lesson 2/3, Unit 3/3**	OB in Practise: **Lesson 3/3, Unit 1/3**	OB in Practise: **Lesson 3/3, Unit 2/3**	OB in Practise: **Lesson 3/3, Unit 3/3**
Feedback	Lesson info: has to be corrected (given date of start: 1 November 2020)	Assignment: „Write a short article“ —> More specific, e.g. 1000 letters							
What to change?	1: (Post a comment): irritating - Write an article or just for commenting an issue?	1: (Unit 2/3, Assignment 2/2) Assignment difficult to understand, is	1: (spelling; first assignment) „...and can be used in almost (all?) learning environments and contexts.“	1: (spelling): isssue date	1: Assignment: „Order OB Platforms alphabetically“ —> irritating task, because too easy		1: (Assignment; quiz in video) Communicate that in the last question multiple choice is able!		
	2: (Spelling): Lesson 1/3, Unit 1/3, Assignment 2/3 „recognise“ —> recognize		2: (2nd assignment) Soft skills and hard skills to be explained	2: Assignment: Image too large (only images up to 1 MB can be uploaded)	2: (spelling) The collection of External links below can help you to find the perfect tool...		2: (Assignment; Own project): Too long text		
	3: (Quiz): Which answers are wrong? After quiz is finished, only the amount of correct/false answers is given, but not which questions were answered wrong/correctly —> hard to repeat and finish unit assignment						3: Group work able? Not mentioned.		
Notes	*Time of 30 minutes sufficient*	*Time of 30 minutes sufficient*	*50 minutes sufficient (including homework)*	*30 minutes sufficient*	*60 Minutes sufficient (including homework)*	*45 Minutes sufficient (including homework)*	*60 Minutes sufficient (including homework)*	*60 Minutes sufficient (including homework)*	*60 Minutes sufficient (including homework)*

Figure 1. The changelog with corrective actions from the second cognitive walkthrough.

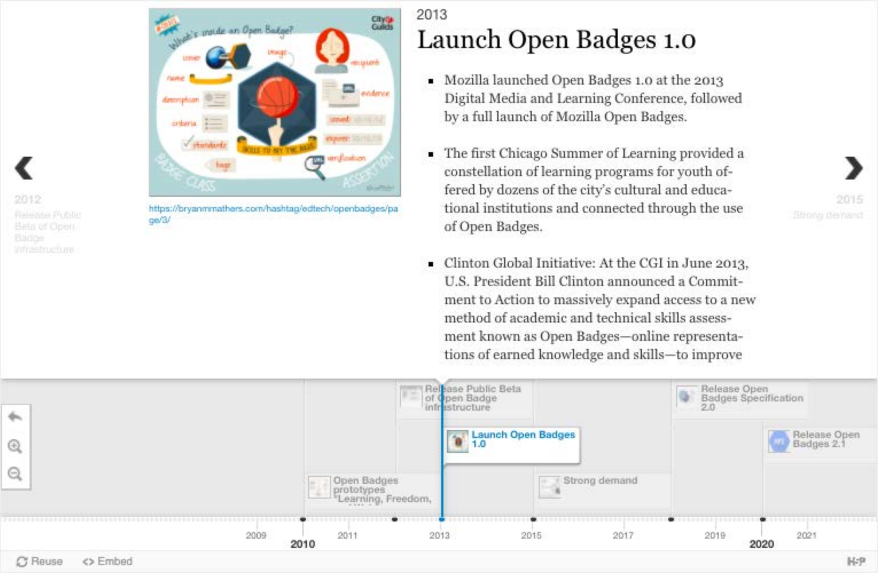
Most of the user requirements from the cognitive walkthroughs documented in the changelogs included specific requests to improve assignments, e. g. to remove redundant questions, to add short information about the length of each assignment and the number of questions in quizzes, to provide feedback on questions, which were not answered correctly, to increase the file size and/or number of files in assignments which include file upload. Further requirements were related to specific H5P learning objects, e. g. H5P learning object “Order existing Open Badge Platforms alphabetically”. was considered to be too easy and thus confusing to both participants. Therefore, the decision was taken to change the format of this H5P learning object into a flip card-model, which gives short information about each Open Badge platform. Another example were questions in interactive videos, which had to be either reformulated for better understanding or repositioned in the videos and placed at more convenient display times, e. g. not too close before the video ends and fades out. Based on the results from cognitive walkthroughs, a number of changes were made to the MOOC design, e. g. requested information about assignments was added to support participants’ orientation, the new terms (e. g. “portfolio”) and less known English words (e. g. ludicrous), which were highlighted as difficult to understand by study participants, were explained and/or simplified, spelling mistakes were corrected, lengthy texts were shortened. Finally, short introductory videos were developed and embedded at the start of each unit to give general information about the content and aims of the unit and at the same time to make the entry of the respective units more personal. The section below presents samples from the final MOOC design which was improved based on the results of the qualitative evaluation.

4.2 MOOC micro-content

The final version of the MOOC "Open Badges for Open Science" implemented in the EMMA MOOC platform includes a total of 14 different micro-learning objects created with H5P. In the sections below we provide selected examples for interactive H5P content for each MOOC level.

4.2.1 Foundations level

The Foundations Level in the MOOC "Open Badges for Open Science" provides an introduction to the topic and an overview of the history, practical uses and good practice examples of Open Badges. There are three key Learning Outcomes at the foundations level, i. e. LO1: Report on how you understand the concept of Open Badges. Focus on the aims and practical uses of Open Badges; LO2: Present/visualise the context of the Open Badges including history and organisations involved; and LO3: Create a portfolio of application fields and good practice examples of Open Badges which are relevant to you and your work. Figure 2 shows an example of the H5P micro-content created to align with the LO2, i. e. "Present/visualise the context of the Open Badges including history and organisations involved". This learning object was created with the H5P Timeline content type and offers an interactive timeline, which illustrates the history of Open Badges from 2009 till 2021.



2013

Launch Open Badges 1.0

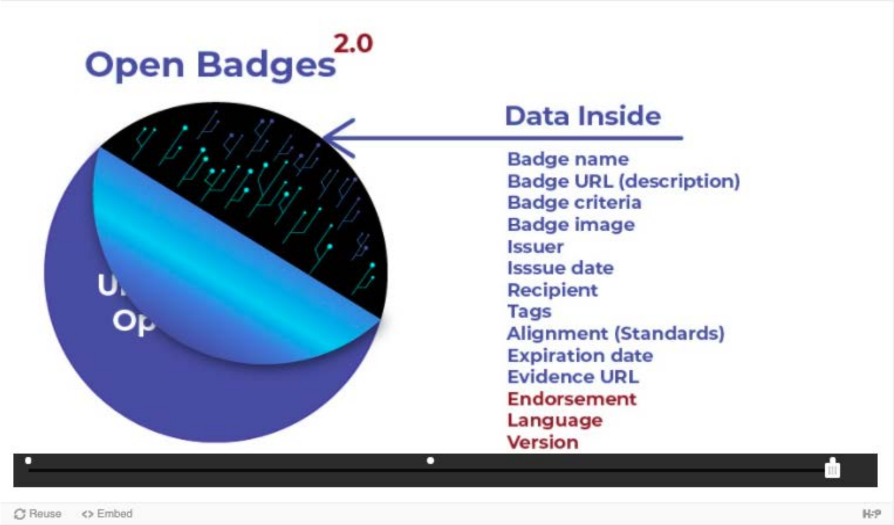
- Mozilla launched Open Badges 1.0 at the 2013 Digital Media and Learning Conference, followed by a full launch of Mozilla Open Badges.
- The first Chicago Summer of Learning provided a constellation of learning programs for youth offered by dozens of the city's cultural and educational institutions and connected through the use of Open Badges.
- Clinton Global Initiative: At the CGI in June 2013, U.S. President Bill Clinton announced a Commitment to Action to massively expand access to a new method of academic and technical skills assessment known as Open Badges—online representations of earned knowledge and skills—to improve

https://bryanmmathers.com/hashtag/edtech/openbadges/page/3/

Figure 2. A sample of H5P micro-content at the foundations level of the MOOC: Timeline illustrating the history of Open Badges created with H5P Timeline.

4.2.2 Technology level

The technology level in the MOOC "Open Badges for Open Science" is an extension to the first level and provides a more in-depth insight into Open Badge technologies. There are three key learning outcomes at this level, i. e. LO1: Demonstrate the technological concept of Open Badges with focus on metadata; LO2: Select and test 2-3 technologies for designing, issuing and earning Open Badges, and LO3: Discuss the potentials and limitations of these technologies. Figure 3 shows an example of the H5P micro-content created to align with the LO1, i. e. "Demonstrate the technological concept of Open Badges with focus on metadata". This learning object was created with the H5P Course Presentation content type and offers an interactive presentation of how the Open Badges standard evolved from version 1 to version 2, and highlights the new metadata types in version 2.



Open Badges 2.0

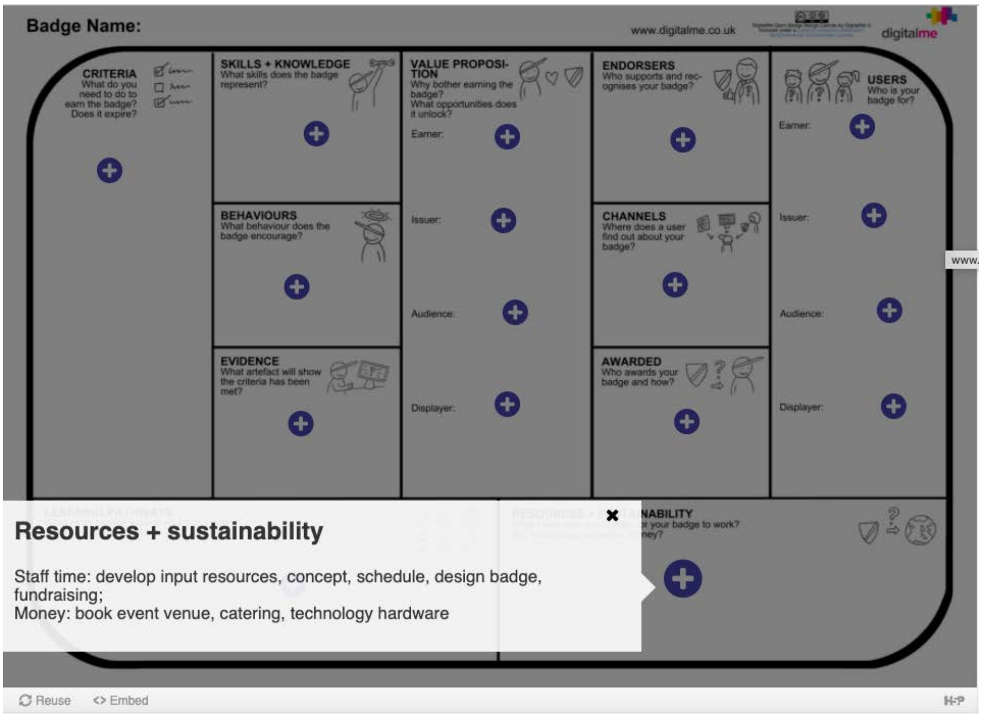
Data Inside

Badge name
Badge URL (description)
Badge criteria
Badge image
Issuer
Isssue date
Recipient
Tags
Alignment (Standards)
Expiration date
Evidence URL
Endorsement
Language
Version

Figure 3. A sample of H5P micro-content at technology level of the MOOC: Illustration of differences between OB1.0 and OB2.0 created with H5P Course Presentation.

4.2.3 Application level

The application level in the MOOC “Open Badges for Open Science” is an extension to the first and second level and praims to encourage and guide learners to design their own Open Badges for Open Science. There are three key learning outcomes at this level, i. e. LO1: List and prioritise key considerations for designing Open Badges; LO2: Plan your own Open Badges project, and LO3: Choose your favorite tool and technically design and issue an Open Badge. Figure 4 shows an example of the H5P micro-content created to align with the LO2, i. e. “Plan your own Open Badges project”. This learning object was created with the H5P Image Hotspots content type and encourages learners to interact with the Badge Design Canvas as a template for designing Open Badges. Learners can explore the fields in the canvas, before applying this template in their own projects.


Badge Name:
www.digitalme.co.uk
digitalme
CRITERIA
What do you need to do to earn the badge? Does it expire?
SKILLS + KNOWLEDGE
What skills does the badge represent?
BEHAVIOURS
What behaviour does the badge encourage?
EVIDENCE
What artefact will show the criteria has been met?
VALUE PROPOSITION
Why bother earning the badge?
What opportunities does it unlock?
Earner:
Issuer:
Audience:
Displayer:
ENDORSERS
Who supports and recognises your badge?
CHANNELS
Where does a user find out about your badge?
AWARDED
Who awards your badge and how?
USERS
Who is your badge for?
Earner:
Issuer:
Audience:
Displayer:
www.
Reuse
Embed
H-P

Resources + sustainability

Staff time: develop input resources, concept, schedule, design badge, fundraising;
Money: book event venue, catering, technology hardware

Figure 4. A sample of H5P micro-content at application level of the MOOC: Interactive Badge Canvas created with H5P image hotspots.

5 CONCLUSIONS

Based on the experiences in the design of the MOOC “Open Badges for Open Science” in the OBERRED project, we can conclude that interactive micro-content can be easily created and shared across multiple learning management systems using the H5P framework. As described in this paper, the production of MOOC micro-learning content with H5P, the storage of H5P learning objects in WordPress and the display in the MOOC on the platform EMMA, have proved to be an easy-to-handle implementation even for non-experts in IT. The qualitative evaluation based on the cognitive walkthrough methodology has also proved to be an effective and efficient way of evaluating the prototypes at different stages of development. Our recommendations for the development of interactive micro-content with H5P include the reuse of existing OERs and the application of the storyboarding method to define which parts of the MOOC can be turned to an interactive H5P content in constructive alignment with the learning outcomes and assessment methods. Next step for us is to run the first pilot of the MOOC and take a deeper look into how H5P content impacts learner experience in the MOOC. Our intention is to examine whether any significant links between the use of the interactive micro-content and MOOC experience and completion rates can be detected. To conduct this research, we plan to use the data analytics on the EMMA platform and to integrate a post-MOOC online survey with questions related to the H5P micro-content. Our general recommendation for further research in this area is to examine whether and how different content types affect learner motivation and the overall experience in the MOOCs in a more systematic way.

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